



Mapping the intellectual structure of modern leadership studies

Modern
leadership
studies

Hsing-Chau Tseng

Chang Jung Christian University, Tainan, Taiwan, Republic of China

Hui-Lien Tung

Paine College, Augusta, Georgia, USA, and

Chi-Hsiang Duan

Chang Jung Christian University, Tainan, Taiwan, Republic of China

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Abstract

Purpose – The purpose of this paper is to explore and map the intellectual structure of leadership studies during 1997-2006. This paper also attempts to help researchers identify the important publications and the influential scholars as well as the correlations among these publications using citation and co-citation.

Design/methodology/approach – In this paper, co-citation analysis and social network analysis techniques are used to research knowledge network of the leadership literature by analyzing 31,232 cited references of 2,322 articles from two leadership related journals in social science citation index and science citation index databases.

Findings – Four factors emerged in this paper: effectiveness of leadership style, leadership theory and development, leadership categorization, and current issues of leadership research.

Originality/value – This paper provides management researchers a tool for evaluating leadership publications and provides a systematic and objective means of determining the relative importance of different knowledge nodes in the development of the leadership research.

Keywords Leadership, Leadership development, Social networks

Paper type Research paper

Introduction

Today's organizations, more than ever, need effective leaders who understand the complexity of the ever-changing global environment; who have the intelligence, sensitivity, and ability to empathize with others; and who can motivate their followers to strive for excellence. Latour (1987) uses scientometrics epistemology to portray the knowledge networks of leadership in terms of its intellectual architects (who), their respective contributions (what), and the time and place in which they published them (when and where) in leadership area. We collected citation data over the ten-year period of 1997-2006 from every issue of leadership quarterly (LQ) and educational leadership (EL). A detailed analysis of 31,232 citations contained in the 2,322 sources articles has been done to trace historical leadership study development and paradigms timeline. The research method used for this study is citation and co-citation analyses. Using citation analysis, the interlinked nodes are discovered. From these nodes, the most influential publications and scholars in the leadership field are identified. And then, co-citation analysis is conducted to map the intellectual structure of leadership studies and to explore the knowledge nodes.



The main purpose of this study is to explore and map the intellectual structure of modern leadership studies during 1997-2006. This study provides researchers a systematic and objective means of determining the important publications, the influential scholars, the correlations among these publications, and the relative importance of different knowledge nodes in leadership research.

Literature review

Leadership is an important concept in the study of groups. Leaders play an active part in development and maintenance of role structure and goal direction and they influence the existence and efficiency of the group (Stogdill, 1974). Leaders must not only exercise influence, but they must also decide when, where, and how influence will be exercised to bring the attainment of social goals (House and Howell, 1992; Mumford and Haythorn, 1986; Winter, 1991). Over the years, many theories have been proposed describing the behaviors that make effective leadership possible – theories of behavioral styles (Lindell and Rosenqvist, 1992), transformational or charismatic leadership (Bass and Avolio, 1994; Klein *et al.*, 1994) and leader-member exchange (Graen and Uhl-Bien, 1995). These theories all have a focus on certain behavior patterns and the implications of these patterns for leader performance.

Knowledge refers to the output of learning process, just as plans are the outputs of the planning process. Gibbons *et al.* (1994) contended that the terms of science and knowledge are frequently adopted interchangeably to form scientific knowledge. Networks have been extensively applied in engineering and science for managing complex systems (Price, 1965). In engineering and sciences, network commonly refers to a system or a web of inter-linked sub-systems or components, each optimally designed to perform a designated task effectively. Each sub-system is highly specialized and generally draws on high levels of accumulated knowledge and expertise within its expected domain of operations. Theoretically, the system as a whole may not be truly optimal, but it can be effective and flexible enough to perform the task at hand, well beyond the capabilities of its individual components. The two components of a network are the nodes and linkages whereby nodes point out the system resources for knowledge generation with their connections via linkages.

Knowledge is complex and invisible, making it very hard to obtain. An effective approach is visualization and representation of knowledge. Chandy and Williams (1994) argued that each localized knowledge network is a part or a sub-system of a broader and more general system. Since the development and diffusion of knowledge of one discipline can be formulated and changed by the nature and objective of relevant journals, one discipline's journals can be regarded as an "invisible hand" influencing the focus of development and diffusion of the knowledge network of a given field. The concept of invisible hand reflects our admiration for the elegant and smooth functioning of the market system as a coordinator of autonomous individual choices in an interdependent world.

An invisible knowledge network of any given field includes both the knowledge content of its nodes and the inter-linkages of those nodes within its domain and to other fields. The knowledge network of leadership can be considered as a branch of its interacting foundational domains, which are well-established sub-systems of leadership. A knowledge network in the leadership field is composed of sufficiently large number of published articles, active researchers (the intellectual architects) and

citations appearing in various media relating to electronic commerce and other fields (Ngai and Wat, 2002; Shaw *et al.*, 1997; Wareham *et al.*, 2005). This knowledge network can depict the developmental and diffusion patterns and processes in the knowledge system of leadership. During the accumulation of cross-field knowledge, key nodes are the most important bridges to connect different or even separate domains. Key nodes gain the main status during the cross-fertilizing process, which facilitates the knowledge communication and transmission among relevant parts of the whole network.

Bibliometrics is a research method used in library and information science. It utilizes quantitative analysis and statistics to describe patterns of publication within a given field or body of literature. Researchers may use bibliometrics to determine the influence of a single author, for example, to describe the relationship between the given author and other authors. Citation analysis is based on the hypothesis that authors cite papers they consider to be important to the development of their research. Chandy and Williams (1994) pointed out that citations are viewed as the explicit linkages between articles that have common aspects. Many researchers have studied citations, the “raw data” of citation analysis. Cronin (1984) described the citation process as a detailed theoretical scrutiny that includes a review of the role and the content of citations. Small (1999) discussed science mapping in the general context of information visualization and reviews attempts to construct maps of science using citation data, focusing on the use of co-citation clusters. Co-citation analysis records the number of papers that have cited any particular pair of documents and it is interpreted as a measure for similarity of content of the two documents. Co-citation analysis is a bibliometric technique that information scientists use to “map” the topical relatedness of clusters of authors, journals or articles, i.e. the intellectual structure of a research field. Co-citation studies compile co-citation counts in a matrix form and statistically scale them to capture “a snapshot at a distinct point in time of what is actually a changing and evolving structure of knowledge” (Small, 1993).

Several studies have used the bibliometric techniques to study management research. For example, Pilkington and Teichert (2006) investigated the intellectual pillars of the management of technology literature and explored whether these are distinct from those commonly associated with its rival fields; Acedo and Casillas (2005) explored the research paradigms of international management research by applying factorial analysis techniques in an author co-citation study; Ramos-Rodriguez and Ruiz-Navarro (2004) examined the intellectual structure change of strategic management research by conducting a bibliometric study of the *Strategic Management Journal*; Ponzi (2002) explored the intellectual structure and interdisciplinary breadth of knowledge management in its early stage of development, using principle component analysis on an author co-citation frequency matrix. No such study has treated the field of leadership; therefore, this study aims to fill a gap in leadership literature by applying bibliometric techniques to a representative collection of research articles to map the structure of this field.

Methodology

The research methods used for this study are bibliometrics and social network analysis. Bibliometrics is a theory-based citation and co-citation analysis. Using citation analysis, the interlinked invisible nodes are discovered from which the most

influential publications and scholars in the leadership field are identified. Further, co-citation analysis is conducted utilizing social network analysis to explore the intellectual structure of the leadership studies and to explore the knowledge nodes that have contributed most to the studies of leadership and their evolution patterns.

The general methods of data gathering and analysis in author co-citation analysis have been described by various scholars (White, 1983; White and Griffith, 1981; McCain, 1983, 1984, 1990). Detailed discussion of retrieval strategies and techniques of data manipulation could be found in these publications. The primary data collection of this study are conducted using bibliographic retrieval methods to ascertain the number of papers which contain at least one reference to each of a specified pair of authors' names, each name being a general representation of that author's work. These data are retrieved using Lockheed's DIALOG to search SSCISEARCH – the online version of Social Science Citation Index (SSCI). The authors' names are entered in the most general form and linked using the "Boolean" and command. The command would retrieve a set of papers, each paper containing at least one reference to a work by A (author name) and one reference to a work by B (author name). The majority, if not all, of the retrieved citing papers identified by this pairing of names would discuss some aspect of rational expectations theory, an area to which both B and A have made important contributions. By using limit command and accession number ranges, the data from SSCI database is transported into successive time periods from 1997 to 2006.

The co-citation counts of all author pairings over time period are organized in the form of a matrix. This matrix represents a profile of co-citation for individual author with every author. The value in diagonal cell is scaled to fit the range of co-citation value in the corresponding column (White and Griffith, 1981). With citation and co-citation analysis, this study has three phases, each of which required different approaches to examine the evolution of the leadership studies:

- (1) *Selection*. Databases and journals as the sources of leadership publications are selected.
- (2) *Data collection and analysis*. The desired information about topics, authors, and journals on leadership research are collected. The collected data are analyzed and systematized by sorting, summing, sub-totaling, ranking, and screening. Key nodes in the knowledge network of leadership studies are identified and the structures developed.
- (3) *Data mapping*. The knowledge network of leadership is mapped to describe the knowledge distribution process in leadership field.

Selection

The databases of SSCI and science citation index (SCI) from 1997 to 2006 serve as the population for our analysis due to their reputations, ease of access, and their comprehensive collection of 6,000 refereed journals. SSCI and SCI provide the most comprehensive and widely accepted databases of leadership publications. We use "key words" search of the journal title fields taking advantage of the management of subject categories in the SSCI and SCI databases to choose sample journals. Among the journals in SSCI and SCI, the LQ and EL are the only two that mainly focus on leadership, thus are chosen as the source to identify the most influential scholars and articles in leadership studies. The advantages of choosing these journals are the

“guaranteed quality” of their published papers and their clear boundaries of what are the acceptable methods and topics of the field as defined by their editorial policies.

Data collection and analysis

Citation data are first collected by counting the number of articles published in the two selected journals and the references these articles cited between 1997 and 2006. Different number of publications and reference data are found: the LQ published 374 articles in total, and cited 21,830 other publications; and the EL published 1,948 articles in total and cited 9,402 other publications, resulting in a total of 2,322 published articles and 31,232 cited publications in these two journals.

Citation is tabulated for each of the 2,322 source documents. These data are imported to Microsoft Excel for analysis. We set the cut-off point for selecting and reporting at frequency ≥ 16 citations for analyzing the more influential authors/articles. About 53 highly cited publications are identified and listed chronologically with full title by a search of database in libraries and then 30 highly cited journal articles are selected.

Data mapping

The key-nodes of the year from 1997 to 2006 are identified (a co-citation matrix). These data are imported to Ucinet software (Borgatti *et al.*, 2002) for social network analysis and factor analysis (Pilkington and Teichert, 2006). Key nodes in the network of knowledge in leadership studies are identified and the structures developed. The knowledge network of leadership is mapped to describe the knowledge distribution process in leadership area.

We use *r*-Pearson as a measure of similarity between author pairs, because it registers the likeness in shape of their co-citation count profiles over all other authors in the set (White and Griffith, 1981). The co-citation correlation matrix is analyzed using varimax rotation, a commonly used procedure, which attempts to fit (or load) the maximum number of authors on the minimum number of factors.

Results

Citation analysis

Among all the cited journal articles, the most cited leadership article titles between 1997 and 2006 are: Conger and Kanungo (1987) “Toward a behavioral theory of charismatic leadership in organizational settings.”; followed by Lowe *et al.* (1996) “Effectiveness correlates of transformational and transactional leadership: a meta-analytic review of the MLQ literature.”; Shamir *et al.* (1993) “The motivational effects of charismatic leadership: a self-concept based theory”; Kerr and Jermier (1978) “Substitutes for leadership: their meaning and measurement.”; House *et al.* (1991) “Personality and charisma in the US presidency: a psychological theory of leader effectiveness” (Table I).

Based on the total number of citations in the two journals, the most cited scholars between 1997 and 2006 are: House, followed by Shamir and Conger (Table II). From the citation samples, the most cited and influential authors were identified. These scholars are highly influential in leadership research and collectively define this field. Although it does not exclude the bias against junior authors, it still represents the focus of the primary authors in the field and this gives us an indication of the popularity of some leadership topic.

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Table I.
Top 30 highly cited
journal articles in
leadership studies
1997-2006

No.	Freq.	Full citation index for journal
1	48	Conger, J.A. and Kanungo, R.N. (1987), <i>Acad Manage Rev</i> , vol. 12, p. 637
2	46	Lowe, K.B. <i>et al.</i> (1996), <i>Leadership Quart</i> , vol. 7, p. 385
3	45	Shamir, B. <i>et al.</i> (1993), <i>Organ Sci</i> , vol. 4, p. 577
4	42	Kerr, S. and Jermier, J.M. (1978), <i>Organ Behav Hum Pref</i> , vol. 22, p. 375
5	40	House, R.J. <i>et al.</i> (1991), <i>Admin Sci Quart</i> , vol. 36, p. 364
6	40	House, R.J. and Aditya, R.N. (1997), <i>J Manage</i> , vol. 23, p. 409
7	38	House, R.J. (1971), <i>Adm Sci Q</i> , vol. 16, p. 321
8	37	Graen, G.B. ND Uhl-Bien, M. (1995), <i>Leadership Quart</i> , vol. 6, p. 219
9	34	Gardner, W.L. and Avolio, B.J. (1998), <i>Acad Manage Rev</i> , vol. 23, p. 32
10	29	Howell, J.M. and Avolio, B.J. (1993), <i>J Appl Psychol</i> , vol. 78, p. 891
11	29	Meindl, J.R. <i>et al.</i> (1985), <i>Admin Sci Quart</i> , vol. 30, p. 78
12	29	Podsakoff, P.M. (1990), <i>Leadership Quart</i> , vol. 1, p. 107
13	28	Bass, B.M. (1997), <i>Am Psychol</i> , vol. 52, p. 130
14	28	Dansereau, F. <i>et al.</i> (1975), <i>Organ Behav Hum Pref</i> , vol. 13, p. 46
15	28	James, L.R. <i>et al.</i> (1984), <i>J Appl Psychol</i> , vol. 69, p. 85
16	27	Lord, R.G. <i>et al.</i> (1984), <i>Organ Behav Hum Dec</i> , vol. 34, p. 343
17	27	Shamir, B. (1995), <i>Leadership Quart</i> , vol. 6, p. 19
18	26	Shamir, B. <i>et al.</i> (1993), <i>Organ Sci</i> , vol. 4, p. 1
19	25	House, R.J. (1974), <i>J Contemp Bus</i> , vol. 3, p. 81
20	24	Graen, G.B. (1987), <i>Res Organ Behav</i> , vol. 9, p. 175
21	24	Hunt, J.G. (1999), <i>Leadership Quart</i> , vol. 10, p. 129
22	24	Klein, K.J. <i>et al.</i> (1994), <i>Acad Manage Rev</i> , vol. 19, p. 195
23	23	Den Hartog, D.N. <i>et al.</i> (1999), <i>Leadership Quart</i> , vol. 10, p. 219
24	23	Kirkpatrick, S.A. and Locke, E.A. (1996), <i>J Appl Psychol</i> , vol. 81, p. 36
25	23	Yukl, G. (1999), <i>Leadership Quart</i> , vol. 10, p. 285
26	22	House, R.J. (1996), <i>Leadership Quart</i> , vol. 7, p. 323
27	22	Schriesheim <i>et al.</i> , C.A. (1999), <i>Leadership Quart</i> , vol. 10, p. 63
28	21	Beyer, J.M. (1999), <i>Leadership Quart</i> , vol. 10, p. 307
29	21	Bycio, P. (1995), <i>J Appl Psychol</i> , vol. 80, p. 468
30	21	Hater, J.J. (1988), <i>J Appl Psychol</i> , vol. 73, p. 695

Co-citation analysis

Data mapping is conducted and intellectual structure of the leadership studies is revealed by using co-citation analysis. Co-citations are tabulated for each of the 2,322 source documents using the Microsoft Excel package. Many of the authors had very low co-citations and were either unlikely to have had a significant impact on the development of the field or were too recent to have had time to impact on the literature. Following the recommended procedures of White and Griffith (1981), the total number of citations in the selected journals is used to identify the top 20 scholars, and then a co-citation matrix (20 × 20) is created to represent the correlations among different publications.

Social network analysis tools can be used to graph the relations in the co-citation matrix and identify the strongest links and the core areas of interest (Pilkington and Teichert, 2006) in leadership field. Figure 1 shows the core of the co-citation in journals articles with links of greater than or equal to ten co-citations shown in the network. Ucinet software (Borgatti *et al.*, 2002) is used to graphically show the core areas of interest. The different shapes of the nodes symbolize results from a faction study of these authors. This method seeks to group elements in a network based on the sharing

No.	Freq.	Key-nodes
1	183	House and Aditya (1997)
2	117	Shamir <i>et al.</i> (1993)
3	67	Conger and Kanungo (1987)
4	61	Graen and Uhl-Bien (1995)
5	50	Howell and Avolio (1993)
6	50	Podsakoff (1990)
7	47	Meindl <i>et al.</i> (1985)
8	46	Lowe <i>et al.</i> (1996)
9	45	Bass (1997)
10	44	Klein <i>et al.</i> (1994)
11	43	Lord <i>et al.</i> (1984)
12	42	Kerr and Jermier (1978)
13	38	Schriesheim <i>et al.</i> (1999)
14	37	Mumford <i>et al.</i> (2000)
15	34	Gardner and Avolio (1998)
16	28	Dansereau <i>et al.</i> (1975)
17	28	James <i>et al.</i> (1984)
18	24	Hunt (1999)
19	23	Den Hartog <i>et al.</i> (1999)
20	23	Kirkpatrick and Locke (1996)

Table II.
Highly cited scholar in leadership studies 1997-2006

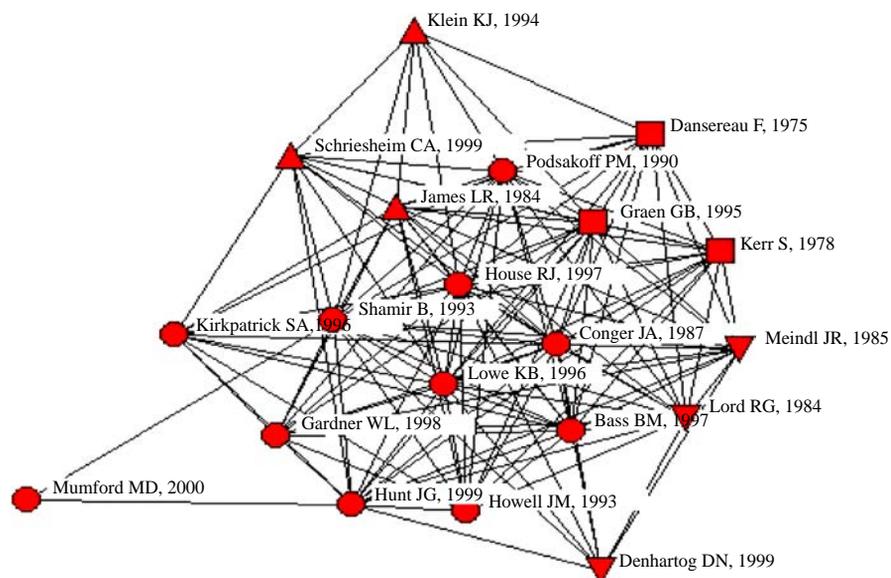


Figure 1.
Co-citation network of leadership studies: 1997-2006

of common links to each other. These factions can be interpreted as concentrating on the interaction between effectiveness of leadership style, leadership theory and development, leadership categorization, the current issues of leadership research.

Figure 1 shows a clear picture. Its focus is only on the very core area. Co-citation matrix and the grouping the authors (using factor analysis of the correlation

between the entries) determine which authors are grouped together and share a common interest. According to this, the closeness of author points on such maps is algorithmically related to their similarity as perceived by citers.

The most influential scholars in the leadership studies between 1997 and 2006 are grouped together. Four factors are extracted from the data and together they explain over 78 percent of the variance in the correlation matrix (Table III). Table IV lists the four most important factors along with the authors that had a factor loading of at least 0.5. We tentatively assign names to the factors on the basis of our own interpretation of the authors with high associated loadings. Our interpretation of the analysis results is that the leadership field comprises of four basic but different sub-fields: effectiveness of leadership style, leadership theory and development, leadership categorization, the current issues of leadership research. We make no attempts to interpret the remaining factors on account of their relative small Eigen values (<1.201). They have been excluded from Table IV likewise.

In Figure 1 and Table IV, Factor 1 showed that the main research focused on “effectiveness of leadership style.” Kirkpatrick and Locke (1996) identified three core components (vision, vision implementation through task cues, and communication style), on the basis of seven charismatic and transformational leadership theories. They used an exploratory path analysis and found a two-part causal sequence, where the vision of quality and vision implementation each affected self-set goals and self-efficacy, which, in turn, affected performance. Howell and Avolio (1993) proposed transactional measures of leadership, including contingent reward and management by exception (active and passive), each negatively related to business-unit performance. Causal relationships between the transformational-leadership behaviors and unit performance were moderated by the level of support for innovation in the business unit. Shamir *et al.* (1993) offered a self-concept based motivational theory to explain the process by which charismatic leader behaviors cause profound transformational effects on followers. Shamir’s theory argued that charismatic leadership has its effects by strongly engaging followers’ self-concepts in the interest of the mission articulated by the leader.

Factor 2 represented the “leadership theory and development. Dansereau *et al.* (1975) found that the degree of latitude that a superior granted to a member to negotiate his role was predictive of subsequent behavior on the part of both superior and member. Contrary to traditional views of leadership, superiors typically employed both leadership and supervision techniques within their units. With a select subset of their members, superiors developed leadership exchanges (influence without authority), and with others, superiors developed only supervision relationships (influence based primarily upon authority). Graen and Uhl-Bien (1995) used a levels perspective to trace the development of leader-member exchange (LMX) through four evolutionary stages of theorizing and investigation up to the present. They also used a domains perspective to develop a new taxonomy of approaches to leadership, and LMX is discussed within

Factor	Eigen value	PCT. of var.	CUM. PCT.
1	9.169	45.1	32.1
2	3.427	16.9	62.0
3	2.184	10.7	72.7
4	1.201	5.9	78.6

Table III.
Eigenvalues of the top
four factors 1997-2006

F1	F2	F3	F4
Effectiveness of leadership style	Leadership theory and development	Leadership categorization	The current issues of leadership research
45.1% variance	16.9% variance	10.7% variance	5.9% variance
Kirkpatrick, S.A. Howell, J.M. Shamir, B. Lowe, K.B. Bass, B.M. Conger, J.A. Gardner, W.L. Hunt, J.G. Podsakoff, P.M. House, R.J. Mumford, M.D.	Dansereau, F. Graen, G.B. Kerr, S.	Lord, R.G. Den hartog, D.N. Meindl, J.R.	Schriesheim, C.A. James, L.R. Klein, K.J.
0.962 0.943 0.927 0.897 0.895 0.862 0.834 0.828 0.819 0.745 0.646	0.876 0.850 0.787	0.85 0.719 0.716	0.862 0.730 0.595

Table IV.
The top 20 authors factor loadings (varimax rotation) at 0.5 or higher 1997-2006

this taxonomy as a relationship-based approach to leadership. Common questions and issues concerning LMX are addressed, and directions for future research are provided. Kerr and Jermier (1978) explained that current theories and models of leadership has been found that certain individual, task, and organizational variables act as “substitutes for leadership,” negating the hierarchical superior’s ability to exert either positive or negative influence over subordinate attitudes and effectiveness. They identified a number of such substitutes for leadership, presented scales of questionnaire items for their measurement, and reported some preliminary tests.

Factor 3 revealed the “leadership categorization.” Lord *et al.* (1984) focused on the study of categorization-based model of leadership perceptions. Impact of prototypicality manipulation on leadership ratings, behavioral expectations and causal ascriptions to the target person. Den Hartog *et al.* (1999) concentrated on culturally endorsed implicit theories of leadership. Their test results supported the hypothesis that specific aspects of charismatic/transformational leadership are strongly and universally endorsed across cultures. Meindl *et al.* (1985) suggestion that the social construction of organizational realities attributes to leadership, the activities, and outcomes of organizations was supported by the results of three archival studies and a series of experimental studies.

Factor 4 proposed the “the current issues of leadership research.” Schriesheim *et al.* (1999) concluded that we may know less than we should about fundamental leader-member exchange processes and that future research must be conducted with greater attention devoted to the key issues. James *et al.* (1984) presented methods for assessing agreement among the judgments made by a single group of judges on a single variable in regard to a single target. The single target could be a manuscript, a lower-level manager, or a team. The methods presented are based on new procedures for estimating inter-rater reliability. These procedures are shown to furnish more accurate and interpretable estimates of agreement than estimates provided by procedures commonly used to estimate agreement, consistency, or inter-rater reliability. Klein *et al.* (1994) highlighted three alternative assumptions that underlie the specification of levels of theory throughout organizational behavior:

- (1) homogeneity within higher level units;
- (2) independence from higher level units; and
- (3) heterogeneity within higher level units.

These assumptions influence the nature of theoretical constructs and propositions and should, ideally, also influence data collection, analysis, and interpretation. Greater attention to levels issues will strengthen organizational theory development and research.

Conclusion

This study is to explore and map the knowledge network of leadership studies during 1997-2006, by analyzing 31,232 cited references of 2,322 articles from two leadership related journals in SSCI and SCI databases. We are able to identify the important publications (high impact) and the influential scholars as well as the correlations among these publications by analyzing citation, co-citation, and conducting social network analysis. Researchers can also use these methods to explore the knowledge network of their own fields.

By using citation analysis, we are able to provide an objective assessment of a large number of publications. Moreover, publications and citation practices provide

an empirical basis for understanding and transmitting the norms in a field. Researchers can also benefit from understanding the citing processes and outcomes because they both reveal the evolution of thoughts in a discipline and provide a sense of the future. As an area of research evolves, theories are continuously advanced and competing until paradigms emerge.

We present the image of a network – i.e. a collection, or a combination, of knowledge resources in a network of interconnected nodes in terms of the intellectual, conceptual or theoretical linkages – capable of portraying the developmental and diffusion patterns and processes in leadership-centered knowledge. Each part of the knowledge network serves a specific purpose in the study of the leadership research. Epistemological scientometrics methodology was used to disclose some information such as highly cited journal articles and researchers in leadership field.

Social network analysis tools can be used to graph the relations in the co-citation matrix and to identify the strongest links and the core areas of interest (Pilkington and Teichert, 2006) in leadership. Co-citation matrix and the grouping of authors (using factor analysis of the correlation between the entries) determined the clusters of authors. According to this, the closeness of author points on such maps is algorithmically related to their similarity as perceived by citers. A factor analysis of the co-citations proposed that the field includes four different concentrations of interest with the ten years:

- (1) effectiveness of leadership style;
- (2) leadership theory and development;
- (3) leadership categorization; and
- (4) the current issues of leadership research.

The knowledge network of leadership and the development path discussed above can help researchers as well as the professionals by recognizing the influential publications and scholars of this field. This method also provides researchers a wide spectrum of inter-connected (web-like) nodes laden with ideas, concepts, and theories from where scholars and thinkers can start their own exploring. In other words, our contributions are providing valuable research direction in the leadership area and an objective and systematic means of determining the relative importance of different knowledge nodes in the development of the leadership field.

Even though this research has its merit of offering valuable insights into the knowledge network of leadership studies, it also has some limitations: our data-collection criteria exclude some journals that may publish leadership articles and the research method of this study could not exclude the phenomenon of self-citation. In order to overcome the limitations associated with citation analysis, future research is encouraged to combine citation analysis with content analysis, a research tool used to determine the presence of certain words or concepts within texts or sets of texts.

References

- Acedo, F.J. and Casillas, J.C. (2005), "Current paradigms in the international management field: an author co-citation analysis", *International Business Review*, Vol. 14, pp. 619-39.
- Bass, B.M. (1997), "Does the transactional – transformational leadership paradigm transcend organizational and national boundaries?", *American Psychologist*, Vol. 52 No. 2, pp. 130-9.

- Bass, B.M. and Avolio, B.J. (1994), "Transformational leadership and organizational culture", *International Journal of Public Administration*, Vol. 17 No. 3, pp. 541-54.
- Borgatti, S.P., Everett, M.G. and Freeman, L.C. (2002), *Ucinet for Windows: Software for Social Network Analysis*, Analytic Technologies, Harvard, MA.
- Chandy, P.R. and Williams, T.G. (1994), "The impact of journals and authors on international business research: a citation analysis", *Journal of International Business Studies*, Vol. 25 No. 4, pp. 715-28.
- Conger, J.A. and Kanungo, R.N. (1987), "Toward a behavioral theory of charismatic leadership in organizational settings", *Academy of Management Review*, Vol. 12 No. 4, pp. 637-47.
- Cronin, B. (1984), *The Citation Process: The Role and Significance of Citations in Scientific Communication*, Taylor Graham, London.
- Dansereau, F. Jr, Graen, G. and Haga, W.J. (1975), "A vertical dyad linkage approach to leadership within formal organizations", *Organizational Behavior and Human Performance*, Vol. 13, p. 46.
- Den Hartog, D.N., House, R.J., Hanges, P.J., Ruiz-Quintanilla, S.A., Dorfman, P.W. and Associates (1999), "Culture specific and cross-culturally generalizable implicit leadership theories are attributes of charismatic/transformational leadership universally endorsed?", *Leadership Quarterly*, Vol. 10, p. 219.
- Gardner, W.L. and Avolio, B.J. (1998), "The charismatic relationship: a dramaturgical perspective", *Academy of Management Review*, Vol. 23, p. 32.
- Gibbons, M., Limorges, C., Nowwothy, H., Schwartzman, S., Scott, P. and Trow, M. (1994), *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies*, Sage, London.
- Graen, G.B. and Uhl-Bien, M. (1995), "Relationship-based approach to leadership: development of leader-member exchange (LMX) theory of leadership over 25 years", *Leadership Quarterly*, Vol. 6, p. 219.
- House, R.J. and Aditya, R.N. (1997), "The social scientific study of leadership: Quo vadis", *Journal of Management*, Vol. 23 No. 3, pp. 409-73.
- House, R.J. and Howell, J.M. (1992), "Personality and charismatic leadership", *The Leadership Quarterly*, Vol. 3 No. 2, pp. 81-108.
- House, R.J., Spangler, W.D. and Woycke, J. (1991), "Personality and charisma in the US presidency: a psychological theory of leader effectiveness", *Administrative Science Quarterly*, Vol. 36, p. 364.
- Howell, J.M. and Avolio, B.J. (1993), "Transformational leadership, transactional leadership, locus of control, and support for innovation: key predictors of consolidated-business-unit performance", *Journal of Applied Psychology*, Vol. 78 No. 66, pp. 891-902.
- Hunt, J.G. (1999), "Transformational/charismatic leadership's transformation of the field. Transforming the twenty-first century army and other top performing organizations", *Leadership Quarterly*, Vol. 10, p. 129.
- James, L.R., Demaree, R.G. and Wolf, G. (1984), "Estimating within-group interrater reliability with and without response bias", *Journal of Applied Psychology*, Vol. 69, p. 85.
- Kerr, S. and Jermier, J.M. (1978), "Substitutes for leadership: their meaning and measurement", *Organizational Behavior and Human Performance*, Vol. 22, p. 375.
- Kirkpatrick, S.A. and Locke, E.A. (1996), "Direct and indirect effects of three core charismatic leadership components on performance and attitudes", *Journal of Applied Psychology*, Vol. 81 No. 1, pp. 36-51.

-
- Klein, K.J., Dansereau, F. and Hall, R.J. (1994), "Levels issues in theory development, data collection, and analysis", *Academy of Management Review*, Vol. 19, p. 195.
- Latour, B. (1987), *Science in Action: How to Follow Scientists and Engineers through Society*, Harvard University Press, Cambridge, MA.
- Lindell, M. and Rosenqvist, G. (1992), "Management behavior dimensions and development orientation", *Leadership Quarterly*, Vol. 3, pp. 355-77.
- Lord, R.G., Foti, R.J. and de Vader, C.L. (1984), "A test of leadership categorization theory: internal structure, information processing, and leadership perceptions", *Organizational Behavior and Human Decision Processes*, Vol. 34, p. 343.
- Lowe, K.B., Kroeck, K.G. and Sivasubramaniam, N. (1996), "Effectiveness correlates of transformational and transactional leadership: a meta-analytic review of the MLQ literature", *Leadership Quarterly*, Vol. 7, p. 385.
- McCain, K.W. (1983), "The author co-citation structure of macroeconomics", *Scientometrics*, Vol. 5, pp. 277-89.
- McCain, K.W. (1984), "Longitudinal author co-citation mapping: the changing structure of macroeconomics", *Journal of the American Society for Information Science*, Vol. 35, pp. 351-9.
- McCain, K.W. (1990), "Mapping authors in intellectual space: a technical overview", *Journal of the American Society for Information Science*, Vol. 41 No. 6, pp. 433-43.
- Meindl, J.R., Ehrlich, S.B. and Dukerich, J.M. (1985), "The romance of leadership", *Administrative Science Quarterly*, Vol. 30, p. 78.
- Mumford, M.D. and Haythorn, W.W. (1986), "Leadership in the organization context: a conceptual approach and its applications", *Journal of Applied Social Psychology*, Vol. 16, 1.6, pp. 508-31.
- Mumford, M.D., Zaccaro, S.J., Zaccaro, S.J., Harding, F.D., Jacobs, T.O. and Fleishman, E.A. (2000), "Leadership skills for a changing world solving complex social problems", *Leadership Quarterly*, Vol. 11, p. 11.
- Ngai, E.W.T. and Wat, F.K.T. (2002), "A literature review and classification of electronic commerce research", *Information & Management*, Vol. 39 No. 5, pp. 415-29.
- Pilkington, A. and Teichert, T. (2006), "Management of technology: themes, concepts and relationships", *Technovation*, Vol. 26, pp. 288-99.
- Podsakoff, P.M. (1990), "Transformational leader behaviors and their effects on followers' trust in leader, satisfaction, and organizational citizenship behaviors", *Leadership Quarterly*, Vol. 1, p. 107.
- Ponzi, L.J. (2002), "The intellectual structure and interdisciplinary breadth of knowledge management: a bibliometric study of its early stage of development", *Scientometrics*, Vol. 55, pp. 259-72.
- Price, D. (1965), "Networks of scientific papers", *Science*, Vol. 149, pp. 510-5.
- Ramos-Rodriguez, A.R. and Ruiz-Navarro, J. (2004), "Changes in the intellectual structure of strategic management research: a bibliometric study of the *Strategic Management Journal*, 1980-2000", *Strategic Management Journal*, Vol. 25, pp. 981-1004.
- Schriesheim, C.A., Castro, S.L. and Cogliser, C.C. (1999), "Leader-member exchange (LMX) research: a comprehensive review of theory, measurement, and data-analytic practices", *Leadership Quarterly*, Vol. 10, p. 63.
- Shamir, B., House, R.J. and Arthur, M.B. (1993), "The motivational effects of charismatic leadership: a self-concept based theory", *Organization Science*, Vol. 4 No. 4, pp. 577-94.

- Shaw, M.J., Gardner, D.M. and Thomas, H. (1997), "Research opportunities in electronic commerce", *Decision Support Systems*, Vol. 21, pp. 149-56.
- Small, H.G. (1993), "Macro-level changes in the structure of co-citation clusters: 1983-1989", *Scientometrics*, Vol. 26, pp. 5-20.
- Small, H.G. (1999), "Visualizing science by citation mapping", *Journal of the American Society for Information Science*, Vol. 50 No. 9, pp. 799-813.
- Stogdill, R.M. (1974), *Handbook of Leadership*, The Free Press, New York, NY.
- Wareham, J., Zheng, J.G. and Straub, D. (2005), "Critical themes in electronic commerce research: a meta-analysis", *Journal of Information Technology*, Vol. 20, pp. 1-19.
- White, H. and Griffith, B. (1981), "Author cocitation: a literature measure of intellectual structure", *Journal of the American Society for Information Science*, Vol. 32 No. 3, pp. 163-71.
- White, H.D. (1983), "A co-citation map of the social indicators movement", *Journal of the American Society for Information Science*, Vol. 34, pp. 307-12.
- Winter, D.G. (1991), "A motivational model of leadership: long-term management success from TAT measures of power motivation and responsibility", *Leadership Quarterly*, Vol. 2 No. 2, pp. 67-80.

Further reading

- Beyer, J.M. (1999), "Taming and promoting charisma to change organizations", *The Leadership Quarterly*, Vol. 10 No. 2, pp. 307-30.
- Yukl, G. (1999), "An evaluation of conceptual weaknesses in transformational and charismatic leadership theories", *Leadership Quarterly*, Vol. 10, pp. 285-305.

Corresponding author

Chi-Hsiang Duan can be contacted at: michael.hsiang@msa.hinet.net